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003/039

TANAKA, et al., 10/790,212
08 February 2007 Amendment
Responsive to 08 November 2006 Office Action

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IN THE SPECIFICATION:

Please replace the paragraphs beginning at line 18 on page 4 of Applicant's specification with the following clarified paragraphs:

Incidentally, in the lithography apparatus, the conventional lithography using a KrF excimer laser or F2 excimer laser has been shifting to lithography using an ArF excimer for the purpose of patterning much thinner gate widths. A resist mask made of a resist material for use in the ArF lithography has an edge portion of large roughness and as the gate width reduces, the dimension of the edge roughness or sidewall striation amounts to a value which cannot be negligible as compared to the gate width.

For the reasons as above, in the trimming treatment using the etching apparatus, alleviation of the edge roughness or sidewall striation by the action of isotropic etching is required in addition to thinning of the mask dimension.

An edge roughness alleviating treatment will be described by making reference to Figs. 10A and 10B. A mask before trimming is illustrated in top view form in Fig. 10A and a mask after trimming is illustrated in top view form in Fig. 10B. Because the wavering line edge of FIGS 10A and 10B mask edge is projected vertically downward by etching, vertical sidewalls of the mask would thus have edge roughness or sidewall striations extending vertically. As will be seen from Fig. 10B, the edge roughness or sidewall striation is alleviated after the trimming and the mask pattern is more smoothed. It will also be seen from the figures that the dimension to be trimmed includes a reduction in dimension due to removal of the edge roughness. When the edge roughness is several nanometers, an unevenness of dispersion of CD permissible for etching work approximately equally amounts to the dimension of the edge roughness. Since the edge roughness portion contours a bulky mask portion and is irregular or rugged in shape, the trimming rate differs

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depending on the degree of the edge roughness. For this reason, in order to set a trimming time necessary for obtaining a desired trimming amount, the degree of edge roughness must be taken into account. The alleviation of edge roughness by trimming is disclosed in, for example, Shabid Rauf et al "Journal of Vacuum Science and Technology B", Vol. 21, No. 2, pp. 655-659, Mar/Apr, 2003.